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EASTERN EUROPE'S ECONOMIC CONTRIBUTION TO SOVIET DEFENSE

INTRODUCTION

This paper explores and sizes the economic contribution of Eastern Europe to the Soviet military effort and the Soviet defense industry. Three areas are examined: the value of East European forces in terms of the ruble cost of equivalent Soviet troops; economies of scale in Soviet arms production made possible by exports of Soviet arms to the region, and transfers of East European technology through Council for Mutual Economic Assistance (CMEA) programs.

EAST EUROPEAN MILITARY FORCES

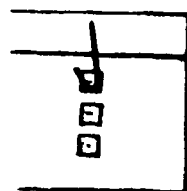
Non-Soviet Warsaw Pact (NSWP) forces would be an essential component in most plausible scenarios for a Warsaw Pact attack on Western Europe. Although Soviet armies would spearhead such an invasion, Soviet military planners appear to have assigned important roles to East German and Polish troops in northern Germany and to the Czechs in the south.¹ In terms of numbers, the NSWP armies field 859,000 men, of whom 655,000 are members of the forces of the Northern Tier (Czechoslovakia, East Germany, and Poland). The Soviets field 565,000 men in the region.² NSWP air defenses are firmly integrated with Soviet operations in the area, and NSWP air forces provide a substantial addition to Soviet forces.³ (S.W.)

In NATO, economic assessments of the relative military contributions of members involve a comparison of budgetary expenditures converted at some accepted rate of exchange. Because of the lack of accepted cross exchange rates and questions concerning Soviet and East European defense budgets, no similar, reliable metric exists for Eastern Europe. An alternative metric is to assess the value of the East

¹Lewis, 1982, p. 292.

²*The Military Balance, 1983-1984*, pp. 18-23.

³Lewis, 1982, p. 112; *The Military Balance, 1983-1984*, pp. 18-23.



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European forces to the Warsaw Pact (and the Soviet Union) by estimating the opportunity cost of these troops using the cost of fielding equivalent Soviet forces. The sum of these costs is the value of East European military efforts and is analogous to the economic methods employed in NATO to measure military burden.

Table 1 provides some rough-and-ready estimates of these costs in terms of 1970 rubles and as a percentage of total Soviet military spending and GNP. The figures are not estimates of what it would cost the Soviets to create new forces tomorrow; rather, they estimate the annual costs the Soviets would incur if East European forces were to be replaced on a one-for-one basis by Soviet troops. Although the Soviets would be highly unlikely to replace East European forces on a one-for-one basis, since East European forces have other purposes than the support of Warsaw Pact military plans, these figures do provide an opportunity cost estimate of the value of such forces. This method is somewhat similar to measurements of burden in NATO; in assessing military contributions, no attempt is made in NATO to disaggregate military expenditures by the smaller powers that are unconnected to the alliance.

The estimates were calculated by multiplying East European ground, naval, and air forces by per-soldier, per-sailor, and per-airman Soviet expenditures on their own forces. These per capita estimates were calculated by dividing Soviet manpower by service into CIA estimates of Soviet military expenditures by service to obtain a figure for rubles per serviceman.⁴

Procurement costs are, of course, a dominant factor in this figure, and East European forces are not equipped with equipment as modern as that used by frontline Soviet forces. Although Czech and East German equipment is slightly more modern, East European armies generally use equipment one to two generations behind that of Soviet forces in the region. To compensate for these discrepancies, 1977 per-soldier costs were employed; the equipment of Soviet forces at that time bears a

⁴Soviet manpower figures were taken from Popper, forthcoming; budget figures were taken from CIA (1978) and The Joint Economic Committee of Congress (1982).

closer correspondence to that of current East European forces than does present Soviet equipment. Data availability and figures for types and vintages of tanks and aircraft provided in *The Military Balance* (1986) determined the year.

As can be seen, the resulting estimates are substantial, equaling roughly 11.5 billion rubles (Table 1). CIA estimates for total Soviet defense expenditures run 83.6 billion rubles for 1986.⁵ Thus, in a rough

Table 1

COSTS OF REPLACING EAST EUROPEAN MILITARY MANPOWER:
MEN UNDER ARMS IN 1985-1986

(in millions of rubles)

Military Service	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Romania
Army	110,000	145,000	120,000	84,000	230,000	140,000
Navy	8,800	0	16,000	0	19,000	7,500
Air Force	34,000	56,000	40,000	22,000	80,000	32,000
Total	152,800	201,000	176,000	106,000	394,000	179,500

ANNUAL SOVIET COSTS OF FIELDING SUBSTITUTE FORCES

(in billions of rubles)

Military Service	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Romania	Total
Army	477.7	629.7	521.1	364.8	998.8	608.0	3,600.1
Navy	199.4	0.0	362.6	0.0	430.6	170.0	1,162.6
Air Force	863.8	1,422.7	1,016.2	558.9	2,032.4	813.0	6,706.9
Total	1,540.9	2,052.4	1,899.9	923.7	3,461.8	1,591.0	11,469.6

SOURCE: East European servicemen: *The Military Balance*; Soviet defense expenditures: Joint Economic Committee, 1982; Soviet servicemen: Popper, forthcoming.

⁵Joint Economic Committee testimony.

sense, the opportunity cost of East European forces was equivalent to 13.4 percent of annual Soviet defense expenditures. This would correspond to an extra 1.9 percentage points of Soviet GNP. The current Soviet burden runs around 14 percent.

These figures should, of course, be taken with a grain of salt. It is not clear that the Romanian armed forces provide a net addition to Soviet military might; other East European armies are also somewhat suspect in terms of reliability. However, even subtracting out Romanian expenditures leaves a total of roughly 10 billion rubles, corresponding to 11.8 percent of the current Soviet military budget.⁶

ARMS TRADE

The Soviet Union also benefits from Eastern Europe through trade in arms and munitions. Experience in Japan, Western Europe, and the United States indicates that development costs are among the most important determinants of military equipment costs. Per-unit costs decline dramatically as production runs increase because these costs are amortized over more units. Long production runs are also associated with more traditional notions of economies of scale, whereby capital-intensive production technologies that lead to lower per-unit costs can be adopted if production runs are long enough to defray the cost of the capital. Thus, large exports of munitions and equipment to Eastern Europe may permit increased economies of scale in arms production, thereby easing the Soviet military burden.

Bulgaria, East Germany, and Hungary all lack large domestic arms industries and must therefore import most of their arms. Poland and Czechoslovakia are important producers of military equipment in their own right. For example, Poland produces military aircraft, most notably

⁶For what it is worth, I converted Poland's and Hungary's officially reported 1986 military budgets into 1986 transferable rubles using official exchange rates. Expenditures were 4,146 and 1,515 million transferable rubles, respectively. These figures should not be compared with those above except in terms of order of magnitude, because 1970 internal rubles are only weakly correlated with 1986 transferable rubles. Despite these caveats, the ratios and magnitudes of the two types of figures are striking.

helicopters; Czechoslovakia produces jet trainers; and both produce tanks.⁷ Some of this production is sold to the Soviets, possibly generating significant Soviet cost savings. However, these countries also import a substantial share of their procurement, mainly from the Soviet Union. Thus, there are a priori reasons for believing that trade in arms in the CMEA might provide significant economic gains.

Total East European Trade in Arms

To get a handle on potential gains from trade one needs to size the flow of arms. Table 2 contains estimates of total East European arms trade. Table 3 outlines estimates of Soviet-East European flows. The estimates are by the Arms Control and Disarmament Agency (ACDA), Vanous (1984), and myself. All three sets of figures have very wide margins of error due to estimation methods. ACDA uses figures provided by other U.S. government agencies. These estimates are probably based on intelligence information of varying quality and are constructed on a building-block basis: All noted transactions are recorded. Thus, they are likely to suffer from errors of omission.

Vanous's and my estimates are based on attempts to isolate arms flows in the trade statistics of the East European countries and the Soviet Union. This *residual* method has the opposite problem of the building-block method: By assigning unidentified commodity flows to arms trade, the researcher runs the risk of exaggerating the extent of the trade because he does not really know what is included in the residual. It is likely to include other commodities besides arms.

Montias (1974) initiated the use of the residual method. He calculates the unidentified commodity residual in Soviet trade with Eastern Europe in CMEA trade Nomenclature Group VII (building materials, construction parts, and unspecified) and assumes that this figure places an upper bound on arms trade. The resulting figures are given in transferable rubles, a unit of account used in the CMEA to measure trade flows.

⁷Rice, 1984.

Table 2

TOTAL EAST EUROPEAN ARMS TRADE

(in millions of transferable rubles)*

Year	Bulgaria		Czechoslovakia		East Germany		Hungary	
	Imports		Exports		Imports		Exports	
	(ACDA)	(ACDA)	ACDA	Crane	(ACDA)	(ACDA)	ACDA	Crane
1970	NA	NA	74	110.4	98	286.7	5	114
1971	NA	NA	74	118.9	110	NA	5	114
1972	NA	NA	165	130.2	174	261.5	41	281
1973	215	4	252	217.6	170	269.9	37	363
1974	205	23	242	229.8	250	289.6	30	371
1975	158	22	223	330.6	353	334.0	36	324
1976	165	8	226	372.0	346	345.0	15	414
1977	140	7	184	402.6	478	143.1	66	368
1978	177	48	82	489.3	646	502.2	41	245
1979	248	33	222	463.7	637	576.5	26	157
1980	97	32	97	483.1	455	708.4	78	104
1981	209	108	230	503.8	432	886.5	86	281
1982	79	237	180	591.5	612	NA	108	324
1983	104	193	NA	639.8	NA	NA	96	563
1984	NA	NA	NA	702.3	NA	NA	NA	NA

Year	Poland		Romania		Soviet Union			
	Imports		Exports		Imports		Exports	
	ACDA	Crane	ACDA	Crane	(ACDA)	(ACDA)	ACDA	Vanous**
1970	109	95	136	236	NA	NA	1350	NA
1971	109	70	156	277	NA	NA	1440	NA
1972	215	91	116	272	NA	NA	2310	NA
1973	304	126	170	342	7	0	3930	NA
1974	273	151	144	459	15	0	3110	NA
1975	252	171	122	725	36	0	2880	NA
1976	293	237	248	660	30	35	3990	NA
1977	272	274	324	609	7	65	4850	NA
1978	122	307	442	657	34	65	5240	NA
1979	131	329	359	665	13	16	8170	NA
1980	110	415	341	668	32	30	7530	5880
1981	317	548	504	435	36	15	8060	7260
1982	180	460	414	345	58	79	8130	8650
1983	NA	644	NA	NA	37	42	7260	9070
1984							850	2041

*Dollar estimates were converted to transferable rubles using the official Soviet rate of exchange.

**CMEA only.

This method was used to estimate total Soviet arms exports to and imports from socialist countries (Table 3). My figures are probably too large; I have probably failed to subtract some identified Soviet exports and imports from the residual category, thereby introducing an upward bias into my estimates. This probably explains the discrepancies between my estimates and those of Vanous, since we used essentially the same method.

A different methodology was used to place an upper bound on Czech arms exports (Table 2). According to Vanous, the Czechs place arms trade within Standard International Trade Classification (SITC) category 718 (other special machinery).⁸ Czech arms exports were estimated by subtracting identified exports in this category from the total figure (Table 2). The unidentified residual was assumed to equal arms exports. These estimates are upper bounds because part of this residual is patently not arms. For example, the method yields a figure of \$6.6 million for Czech arms exports to the European Economic Community (EEC), really represents unidentified exports of special machinery. In 1980, however, the Czechs record exports of \$145.5 million to Libya in this category, of which \$122.9 million is not identified. This figure supports Vanous's assertion. The estimates exceed those of ACDA, however; ACDA figures for Czech arms exports to Libya for the 1976-1980 period ran \$280 million, whereas this method yields an export figure of \$351.6 million.⁹

I developed a different methodology for the estimation of Czech arms imports. As noted above, Vanous (1984) argues that arms trade is contained in Czech statistics on machinery trade. Czech input-output tables record both domestically produced inputs and imported inputs in

⁸This is according to the old SITC 1 classification system. Vanous (1985) argues that in the revised classification system arms trade falls into SITC categories 728 (other equipment specialized for particular industries), 745 (other nonelectrical machinery, tools, and parts, not elsewhere specified) and 784 (motor vehicle parts and accessories not elsewhere specified). He also places unidentified machinery sales into the arms category.

⁹ACDA, 1983.

each cell. A large share of final output of the category "Other Industrial Production" in these tables goes to "Social Consumption," the national income accounting category in which material consumption by the military appears to enter, and exports. Exports and imports from this category, when added to trade figures from the machinery and electro-technical categories, generate figures more consistent with Czech machinery trade figures than these two industries alone. Thus it is possible that entries from this row in the "Social Consumption" column include arms imports. The estimates in Table 2 were made under this assumption.¹⁰

Total Polish exports of arms were derived by subtracting estimates of procurement of domestically produced military durables from arms production estimates.¹¹ Although these estimates should be treated with skepticism in that they equal the difference of two residuals, they do provide a useful consistency check on the estimates of arms exports to the Soviet Union in Table 3. As can be seen, prior to 1981 these estimates of total exports have been consistent with estimates of sales to the Soviet Union. These estimates also fall within the unidentified share of total Polish machinery exports.

Soviet-East European Trade in Arms

Vanous (1984) claims that the unidentified residual in Soviet trade with socialist countries, presumed to be Soviet arms trade, can be broken down through the analysis of statistics on trade in machinery. According to Vanous, arms trade is recorded by the East Europeans in machinery trade--not in the unspecified-commodity residual, where they probably appear in the Soviet statistics. Consequently, the difference between Soviet and East European machinery trade statistics should equal Soviet arms trade with these countries. Vanous's estimates for Soviet arms trade by CMEA country appear to be made on this basis (Table 3).

¹⁰See Crane, 1987, for details.

¹¹Ibid.

My estimates for Hungarian arms trade with the Soviets were also constructed with this method (Table 3). Soviet machinery exports in rubles were converted into forints using Hungarian ruble-forint exchange rates. This figure was then subtracted from Hungarian machinery imports from the Soviet Union, and the residual was assumed to equal arms imports. The same procedure was used with Hungarian machinery exports and Soviet machinery imports to calculate Hungarian military exports.

My estimates are close to Vanous's but not identical (Table 3). Differences are methodological; Vanous uses the unaccounted residual for Soviet trade with the CMEA to calculate total Soviet CMEA arms and then allocates this residual on the basis of Soviet machinery trade with the individual countries. I rely solely on Hungarian and Soviet bilateral trade data.

The figures for Hungarian arms imports from the Soviet Union are plausible although probably exaggerated because of the differences in trade reporting systems. The Soviets record all their data free on board, and the Hungarians record imports' cost of insurance and freight. However, the arms import estimates run from one-fourth to one-third of total Hungarian machinery imports from the Soviet Union. Even if trade and insurance costs accounted for 5 percent of the machinery import bill (about 10 to 20 percent of the discrepancy), the remaining difference is so large that arms trade seems the most probable explanation. Moreover, the numbers easily fit into the published figures for the defense budget.

Hungary publishes fairly detailed breakdowns of trade by country and commodities. These data were used to check the plausibility of the import figures. Estimates of total Soviet arms exports to Hungary would not fit into a single commodity category. However, figures for imports of "Other Machinery" and "Components and Spare Parts" were not subdivided by the Hungarians, and their sums are substantially greater than the estimates for arms trade, so arms imports may be hidden in these two categories.

Table 3

SOVIET-EAST EUROPEAN ARMS TRADE

(in millions of transferable rubles)

Year	SOVIET EXPORTS										Total Socialist Countries
	Bulgaria (Vanous)	Czechoslovakia (Vanous)	East Germany (Vanous)	Hungary		Poland		Romania (Vanous)	Total CMEA (Vanous)	Crane	
				Crane	Vanous	Crane	Vanous				
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	969	NA
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,103	NA
1972	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,375	NA
1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,560	NA
1974	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,891	NA
1975	NA	NA	NA	120	NA	NA	NA	NA	NA	1,987	NA
1976	NA	NA	NA	125	NA	NA	NA	NA	NA	2,508	NA
1977	NA	NA	NA	109	NA	NA	NA	NA	NA	2,765	NA
1978	NA	NA	NA	167	NA	NA	NA	NA	NA	2,798	NA
1979	NA	NA	NA	248	NA	301	NA	NA	NA	3,244	NA
1980	231	447	459	142	170	387	362	197	1,866	3,448	2,202
1981	385	476	496	185	183	515	485	187	2558	3,885	2,212
1982	439	448	598	157	155	415	364	212	2747	4,295	2,216
1983	660	570	528	266	203	476	402	237	3150	4,714	2,600
1984	NA	NA	NA	203	NA	NA	NA	NA	NA	4,886	NA

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Year	Bulgaria (Vanous)	SOVIET IMPORTS										Total	
		Czechoslovakia		East Germany	Hungary		Poland		Romania	Socialist Countries			
		Crane	Vanous	(Vanous)	Crane	Vanous	Crane	Vanous	(Vanous)	Crane	Vanous		
1970	NA	70.3	NA	NA	NA	NA	NA	NA	NA	655.9	NA		
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	682.0	NA		
1972	NA	107.7	NA	NA	NA	NA	NA	NA	NA	752.2	NA		
1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	893.9	NA		
1974	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,117.7	NA		
1975	NA	145.0	NA	NA	3	NA	NA	NA	-	1,373.7	NA		
1976	NA	169.5	NA	NA	28	NA	NA	NA	-	1,514.3	NA		
1977	NA	7.5	NA	NA	62	NA	NA	NA	-	1,522.6	NA		
1978	NA	243.9	NA	NA	-281	NA	NA	NA	-	1,773.7	NA		
1979	NA	316.1	NA	NA	36	NA	NA	NA	-	2,112.6	NA		
1980	252	364.0	317	170	32	30	244	NA	-	2,434.4	1,119		
1981	312	445.6	389	220	79	76	373	350	-	2,864.1	1,319		
1982	413	651.3	403	284	82	79	354	322	-	3,363.4	1,640		
1983	479	NA	525	350	92	131	523	461	-	3,739.3	2,041		
1984	NA	NA	NA	NA	112	NA	597	556	-	4,016.6	NA		

SOURCES: Vanous, 1984, p. 4; Crane, 1987, pp. 102, 104, 105, 107.

The figures for arms exports are more doubtful. On the one hand, Hungarian exports and Soviet imports are both recorded free on board, so the discrepancy in these statistics cannot be ascribed to insurance and freight costs. These discrepancies are, however, quite small for all years except 1978 and 1982. Although Hungarian arms exports to the Soviet Union are probably minor, since Hungary has little in the way of an arms industry, my estimates are so small that they could just as well be ascribed to differences resulting from statistical collection techniques.¹² Moreover, the negative figure for 1978 is very puzzling. The most plausible explanation is that the Soviets recorded shipments of machinery and materials for the Orenberg pipeline that were financed by Hungary, but not produced there, as Hungarian imports in that year, while the Hungarians did not record them as exports.

No attempt was made to estimate Hungarian arms exports to countries other than the Soviet Union. Hungarian arms production appears to be so small that it is highly unlikely that arms exports are detectable in the published data.

Vanous's approach was also used to calculate Polish-Soviet arms trade (Table 3). Soviet machinery exports in rubles were converted into zlotys using Polish ruble-zloty exchange rates. These figures were then subtracted from Polish machinery imports from the Soviet Union, and the residual was assumed to equal arms imports. The same procedure was used with Polish machinery exports and Soviet machinery imports to calculate Polish military exports. Unlike Hungary, Poland does not disaggregate trade by country according to the CMEA trade nomenclature system but instead uses its own classification scheme. Items such as ship repairs and household appliances, included in the Polish statistics, had to be netted out to make the Polish data more consistent with the Soviet figures. This procedure doubtless introduced some error into the figures, since Polish enumeration of trade in machinery with the Soviet Union excludes some items. Nonetheless, the margin of error is probably

¹²Soviet imports are probably registered after the Hungarians register exports. Consequently, differences in exports and imports may be due to time lags.

small. Moreover, the resulting residual is so large that trade in arms offers the best hypothesis explaining the discrepancy.

This lengthy discussion of methodology was included to show the tentative nature of the estimates. Several strong assumptions had to be made to construct these figures, introducing substantial uncertainty into their accuracy. Judgments made using these data should be weighted accordingly. On the other side of the coin, these figures have been compared with other data to check for consistency. Estimates of procurement and arms production constructed from other data are consistent with these estimates. Moreover, these particular residuals were chosen after close examination of the statistical yearbooks of Czechoslovakia, Hungary and Poland. Several unexplained items or inconsistencies in data sets determined the choice of residuals.¹³ If the estimates are rejected out of hand, it is incumbent on the critic to provide alternative explanations for these residuals in the statistics of these countries.

CMEA Arms Trade and its Contribution to the Soviet Defense Sector

Unfortunately, even these uncertain estimates of arms trade do not provide a means of estimating Soviet gains from arms trade with Eastern Europe. The ratios constructed in Table 4 are, however, designed to give a hazy idea of the importance of arms trade in Soviet trade with these countries. As can be seen, a sizable share of Soviet trade with these countries may consist of arms. Even more striking is the share of Soviet machinery exports composed of arms. According to my calculations, these run from 25 to 50 percent of Soviet machinery exports to Hungary and Poland. Vanous's figures imply similar ratios for Czechoslovakia and East Germany. These figures indicate that aside from arms, Soviet machinery producers have a difficult time exporting their wares to Eastern Europe as well as to the rest of the world.

¹³For example, the very large imports recorded under "Administrative and Other Services" in the Hungarian input-output tables indicate that arms imports may be recorded under this category. Arms imports also seem to offer the most plausible explanation of the large discrepancies between Soviet figures for machinery exports to Hungary and Poland and imports of machinery by these countries (30 to 40 percent of total imports in this category).

Table 4
RELATIVE MAGNITUDE OF SOVIET-EAST EUROPEAN ARMS TRADE
(in millions of transferable rubles)

ARMS AS A PERCENT OF SOVIET EXPORTS TO EASTERN EUROPE									
Year	Bulgaria (Various)	Czechoslovakia (Various)	East Germany (Various)	Hungary (Crane)	Poland (Crane)	Romania (Various)	CMEA (Various)	Socialist Countries (Crane)	Various
1972	NA	NA	NA	NA	NA	NA	NA	11.7	NA
1973	NA	NA	NA	NA	NA	NA	NA	12.1	NA
1974	NA	NA	NA	NA	NA	NA	NA	12.4	NA
1975	NA	NA	NA	7.2	NA	NA	NA	10.7	NA
1976	NA	NA	NA	7.1	NA	NA	NA	11.5	NA
1977	NA	NA	NA	5.3	NA	NA	NA	10.4	NA
1978	NA	NA	NA	5.1	NA	NA	NA	11.8	NA
1979	NA	NA	NA	9.0	7.8	NA	NA	11.7	NA
1980	6.3	12.3	9.4	4.8	8.8	14.6	8.9	10.4	8.2
1981	8.8	10.9	9.0	5.6	10.4	10.5	9.1	10.4	8.2
1982	9.0	8.9	9.3	4.2	8.6	14.9	8.4	10.1	8.0
1983	12.0	9.7	7.8	6.6	9.0	14.5	8.9	10.3	8.4
1984	NA	NA	NA	NA	10.6	NA	NA	10.2	NA
1985	NA	NA	NA	NA	NA	NA	NA	10.6	NA
1986	NA	NA	NA	NA	NA	NA	NA	10.7	NA

ARMS AS A PERCENT OF SOVIET IMPORTS FROM EASTERN EUROPE									
Year	Bulgaria (Various)	Czechoslovakia (Crane)	East Germany (Various)	Hungary (Crane)	Poland (Crane)	CMEA (Various)	Socialist Countries (Crane)	Various	
1970	NA	6.3	NA	NA	NA	NA	NA	NA	
1971	NA	0.0	NA	NA	NA	NA	NA	NA	
1972	NA	7.8	NA	NA	NA	NA	7.7	NA	
1973	NA	0.0	NA	NA	NA	NA	7.4	NA	
1974	NA	0.0	NA	NA	NA	NA	7.3	NA	
1975	NA	7.7	NA	0.2	NA	NA	6.4	NA	
1976	NA	7.6	NA	1.6	NA	NA	7.4	NA	
1977	NA	0.3	NA	3.2	NA	NA	8.0	NA	
1978	NA	8.0	NA	NA	NA	NA	7.3	NA	
1979	NA	9.9	NA	1.5	6.5	5.9	7.1	NA	
1980	7.3	10.3	3.9	1.2	10.4	6.2	7.5	NA	
1981	8.4	10.9	4.3	2.4	11.0	6.7	7.9	NA	
1982	9.6	13.8	4.9	2.2	12.8	7.4	7.9	NA	
1983	9.5	NA	5.3	2.3	12.5	NA	8.5	NA	
1984	NA	NA	NA	2.5	NA	NA	8.8	NA	
1985	NA	NA	NA	NA	NA	NA	8.8	NA	
1986	NA	NA	NA	NA	NA	NA	9.6	NA	

SOURCES: Various, 1984, p. 4; Crane, 1987, pp. 102, 104, 105, 107.

I also attempted to gain a very rough idea of the importance of East European arms trade in terms of Soviet procurement using tentative calculations for the ratio of the value of arms trade to domestic procurement. Procurement figures were estimated using CIA estimates of the Soviet defense budget and CIA figures for the percentage of procurement in ruble defense spending (a little more than half).¹⁴ Barry Kostinski has noted that domestic and transferable ruble machinery prices in intra-CMEA are often equal. By this assumption, the ratios in Table 5 would apply.

Although the figures are imprecise, they suggest that Eastern Europe probably provides a small, if tangible, share of Soviet procurement. The East European market is a significant one for Soviet arms exporters, but the hard-currency market is probably more important not only in terms of type of currency (dollars instead of transferable rubles) but also in terms of total value. Thus export markets, including that of Eastern Europe, probably permit Soviet weapons manufacturers to make longer production runs, thereby spreading R&D

Table 5

PERCENTAGE OF ARMS TRADE ESTIMATES TO SOVIET PROCUREMENT ESTIMATES

Year	CMEA Exports/ Soviet Procurement	CMEA Imports/ Soviet Procurement	Total Arms Exports/ Soviet Procurement
1980	7.0	4.2	20.7
1981	8.0	4.8	24.9
1982	7.8	5.8	28.5
1983	8.8	6.9	28.8

SOURCE: Arms trade figures were taken from Vanous, 1984. Procurement figures computed from CIA, 1978, The Joint Economic Committee of Congress, 1982, and Hildebrandt (personal communication).

¹⁴CIA, 1978, p. 2.

costs over more units than would otherwise be the case. However, although the East European market is significant, it is small in relation to total Soviet arms production.

EAST EUROPEAN CONTRIBUTIONS TO SOVIET MILITARY TECHNOLOGY

Soviet leaders appear to have had an ambivalent attitude toward the development of East European capabilities in arms production and military technology. Polish production of fighters was phased out in 1951, possibly at Soviet insistence.¹⁵ East Germany does not manufacture any major pieces of military equipment, which appears to be partially the result of Soviet desires. Poland and Czechoslovakia, the two major producers of tanks in Eastern Europe, only assemble Soviet designs, and they still manufacture older models such as the T-55¹⁶; only now are they beginning full-scale production of the T-72, which is not the most modern Soviet tank.

On the other hand, national security concerns are given as part of the justification for many of the economic policy initiatives adopted by the CMEA to improve cooperation both in research and development and in production within Eastern Europe. Recent initiatives by Gorbachev to establish science and technology agreements for the coordination of research and development are partially motivated by interest in accelerating the development of technologies with military applications (e.g., electronics and lasers). These agreements are, however, of only recent vintage (1984); at this point their contribution to Soviet military efforts is indeterminate.

Specialization and cooperation agreements have been another important policy instrument for pursuing these goals. During the 1970s, these agreements became one of the most important economic policy instruments in the CMEA. Under these treaties, which are signed between two or more CMEA members, one or more of the participants agree to

¹⁵Babiejczuk, 1974, p. 16.

¹⁶Romania produces its own design, but only in small numbers (*The Military Balance*, various years).

specialize in the manufacture of a product and to meet the needs of the other signatories for that product. Signatories frequently specify more than one product in the agreements and, in effect, swap production of different but related products.

Cooperation agreements involve enterprises from different countries in the production of a single product. One enterprise usually supplies the other with components. In practice, the two types of agreements are frequently intertwined: a country agrees to import from another under a specialization agreement but balances the imports with exports of components incorporated in the product through a cooperation agreement. In the CMEA literature they are usually referred to simultaneously as "specialization and cooperation agreements."

There is one multilateral specialization agreement in arms that covers the entire CMEA, with the possible exception of Romania. Little else is known about it. However, many other agreements have been created with military concerns in mind.

One such agreement with military applications was the Multilateral Governmental Agreement on the Development, Production, and Application of Data Processing Equipment, signed in 1969. The agreement was specifically designed to create the mutually compatible RYAD family of computers. This family, modeled after the IBM S/360 machines of the 1960s, has provided computing capabilities that the Bloc could not import from the West because of Coordinating Committee on Export Controls (CoCom) restrictions.

The agreement has been judged a partial success by both CMEA and Western analysts.¹⁷ It has succeeded in inducing countries to specialize: The USSR manufactures large computers; Hungary makes minicomputers and punch-card equipment; East Germany produces line printers; and Bulgaria has specialized in disk drives.¹⁸ This is no small feat when one compares this industry to others in which standards and systems used by one Bloc member are often incompatible with those used by another. For example, only with the spread of FIAT technology

¹⁷Goodman, 1979; Livintsev, 1983.

¹⁸Breitner, 1973, pp. 19-24.

throughout Eastern Europe (Soviet Ladas, Polski FIATs, and Yugoslav FIATs) has much progress been made in expanding trade in automobile components. Domestically designed cars like the East German Trabant and Wartburg and the Czech Skoda are so different from other makes that component suppliers have difficulty servicing more than one type of car in the Bloc.

Some sense of the importance of specialization agreements as a means of concentrating Soviet defense can be garnered from an examination of their distribution. Of over 1,200 agreements identified in a recent RAND study,¹⁹ 110 covered machine tools, 133 transport equipment, and 90 electronics, all important industries for Soviet weapons producers. These were also some of the industries most often discussed in CMEA communiques and in articles discussing CMEA trade. On the other hand, the chemical industry recorded the highest number of such agreements (188), and 101 agreements were found in the consumer goods industries. Only 11 agreements were recorded in automatic and flexible production systems, an industry with important military implications. In short, there are substantial, but not inordinate, numbers of specialization agreements within militarily important industries in the Bloc.

East European manufacturers also contribute to the Soviet military by providing important components. For example, East Germany's Zeiss provides optical equipment that is incorporated into Soviet weapons. The Hungarians and Poles export telecommunications equipment used in the military. This said, one should not overestimate the East European contribution. With the exception of imports of Czech jet timers, the Soviets are self-sufficient in military hardware. They do not appear to import any major weapon system.

Thus, the evidence of a significant East European contribution to production and to research and development in militarily significant industries is mixed. The production of military goods per se is limited and generally confined to obsolete models. However, some success has been generated in cooperating in the development of militarily

¹⁹Crane, 1987.

significant technologies such as computing. In general, neither science and technology nor specialization agreements have been designed to tap into preexisting East European technologies; they are used to coordinate and concentrate development efforts across the Bloc. In fact, there is probably no stock of East European technologies, especially military technologies, of which the Soviets are unaware.

CONCLUSIONS

The intent of this paper has been to size the economic importance of Eastern Europe for the Soviet defense sector. The rough estimates constructed indicate that the opportunity cost of East European forces in 1986 equaled 11.5 billion 1970 rubles, equivalent to 14 percent of 1986 Soviet military expenditures. Soviet arms exports to Eastern Europe are probably less than nonsocialist arms exports, but they may amount to a non-negligible, albeit small, fraction of the Soviets' own procurement. Soviet imports of arms from Eastern Europe appear to be of lesser importance. Official CMEA statements concerning economic policy initiatives indicate that security concerns play an important role in their initiation, especially in science and technology agreements and specialization agreements in militarily important industries.

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